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TWO NEW BRANCHIATE SCALE-WORMS (POLYNOIDAE: POLYCHAETA) FROM THE HYDROTHERMAL VENT OF THE OKINAWA TROUGH AND THE VOLCANIC SEAMOUNT OFF CHICHIJIMA ISLAND

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Abstract.—Two new polynoid polychaete species are described from the Kaikata Seamount, a volcanic front of Izu-Ogasawara Island-Arc system, and the Izena Hole, a hydrothermal vent in the Okinawa Trough. *Branchipolynoe pettiboneae,* found living commensally in the mantle cavities of deep-sea mussels, is close to *B. seepensis* in having large elytra and branchiae beginning on segment 3, however the new species differs from the latter in having the subbiramous parapodia with digitiform notopodia instead of the biramous parapodia with conical notopodia. *Opisthotrochopodus japonicus* differs from other congeners in having the ventral cirri and lacking the modified neuropodial organs on posterior parapodia.

Since the first branchiate scale-worm was found from the Galapagos Rift area (Pettibone 1984), 10 species attributed to 4 genera and 3 subfamilies have been described from various deep-sea hydrothermal vents and cold-seeps by Pettibone (1985a, 1985b, 1986, 1988, 1989a, 1989b) and another deep-sea species from experimentally enriched substrates by Desbruyères & Laubier (1988). Although several vents and seeps are known around Japan and many surveys using manned or unmanned deep-sea submersibles were carried out, none of the branchiate polynoids has been recorded. In this study, two new branchiate polynoid species are described from the Kaikata Seamount, a volcanic front of Izu-Ogasawara Island-Arc system, and the Izena Hole, a hydrothermal vent in the Okinawa Trough.

The types are deposited in the National Science Museum, Tokyo (NSMT), the Japan Marine Science and Technology Center (JAMSTEC), and the National Museum of Natural History, Smithsonian Institution (USNM).

Subfamily Branchipolynoinae Pettibone, 1984

Genus *Branchipolynoe* Pettibone, 1984

Branchipolynoe pettiboneae, new species

Figs. 1–3

Material.—Kaikata Seamount, off Chichijima Island, Western Pacific, DSRV *Shinkai 2000* Dive 339, 17 May 1988, 26°42.3′N, 141°05.0′E, 580 m, collector J. Naka, associated with deep-sea mussel, holotype (NSMT Pol.-H 327). Izena Hole, Okinawa Trough, Dive 364, 10 Sep 1988, 27°16.0′N, 127°05.0′E, 1340 m, collector M. Kimura, associated with deep-sea mussels, paratype (USNM 131183), 3 paratypes (JAMSTEC).

Description.—Holotype 27 mm long, 11 mm wide including parapodia (4 mm without parapodia), with 21 segments, including first achaetous tentacular segments. Body short, slightly tapered anteriorly and posteriorly, flattened ventrally and arched dorsally (Fig. 1a, b). Pairs of long ventral papillae on segments 11 and 12; pygidium with pair of anal cirri, not fused basally (Fig. 1b).

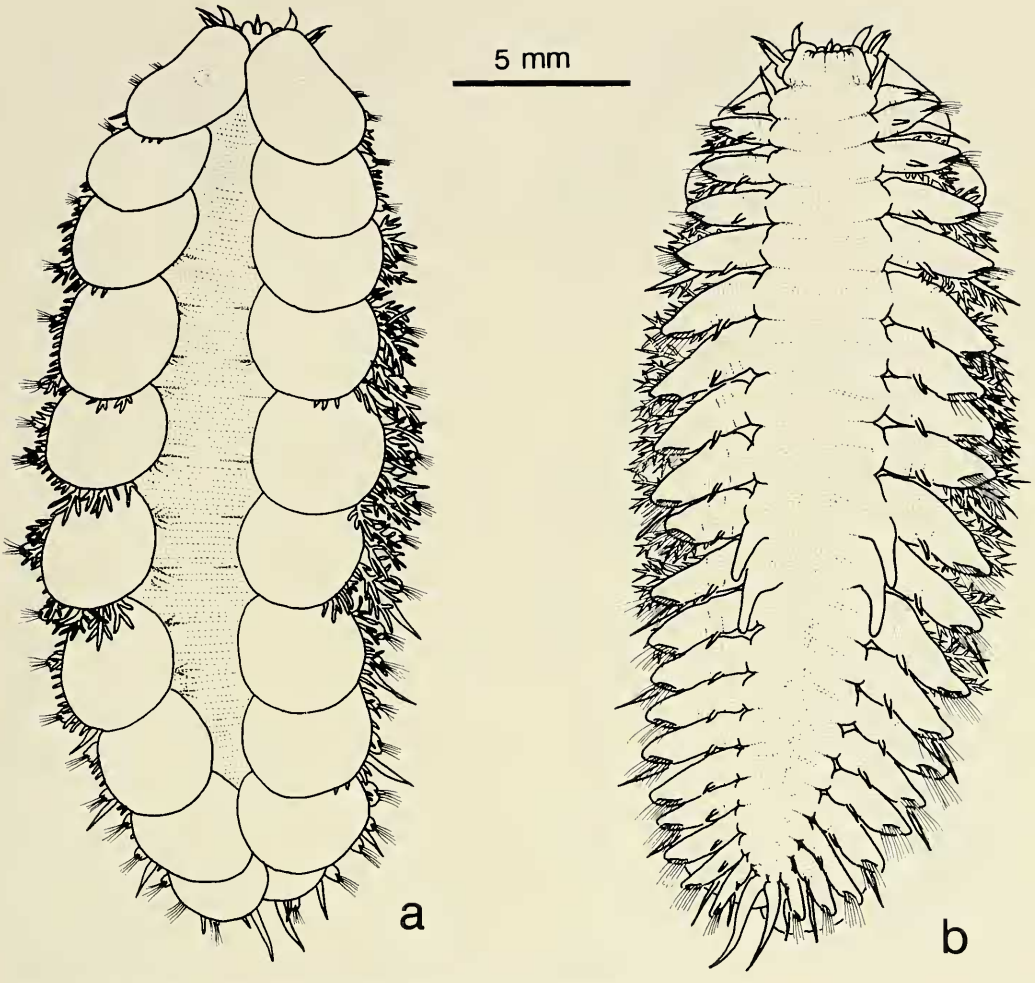

Fig. 1. *Branchipolynoe pettiboneae,* Holotype: a, Dorsal view; b, Ventral view.

Elytra 10 pairs, moderately large, oval, opaque, smooth, present on segments 2, 4, 5, 7, 9, 11, 13, 15, 17, and 19. First pair and last 2 pairs of elytra covering dorsum completely, others leaving middle third of body uncovered (Fig. 1a). Dorsal cirri on non-elytragerous segments with short cylindrical cirrophores, short styles with slender tips, extending to tips of neurosetae; dorsal tubercles indistinct. Branchiae starting on segment 3, arborescent, separated into upper larger and lower smaller groups (Fig. 2a, e–h).

Prostomium oval, bilobed, with rounded anterior lobes, lacking frontal filaments (Fig. 2a). Median antenna, short, conical, with slender tip, without distinct ceratophore. Ventrolateral palps thick, smooth, tapered, extending beyond prostomium, with slender tips. First tentacular segment achaetous, fused to prostomium, not distinct dorsally; tentaculophores lateral to prostomium with 2 pairs of tentacular cirri, slightly shorter than palps (Fig. 2a, b).

Segment 2 with first pair of elytrophores, with subbiramous parapodia; notopodium very small, digitiform, with 4 notosetae, scarcely projecting beyond notopodium;

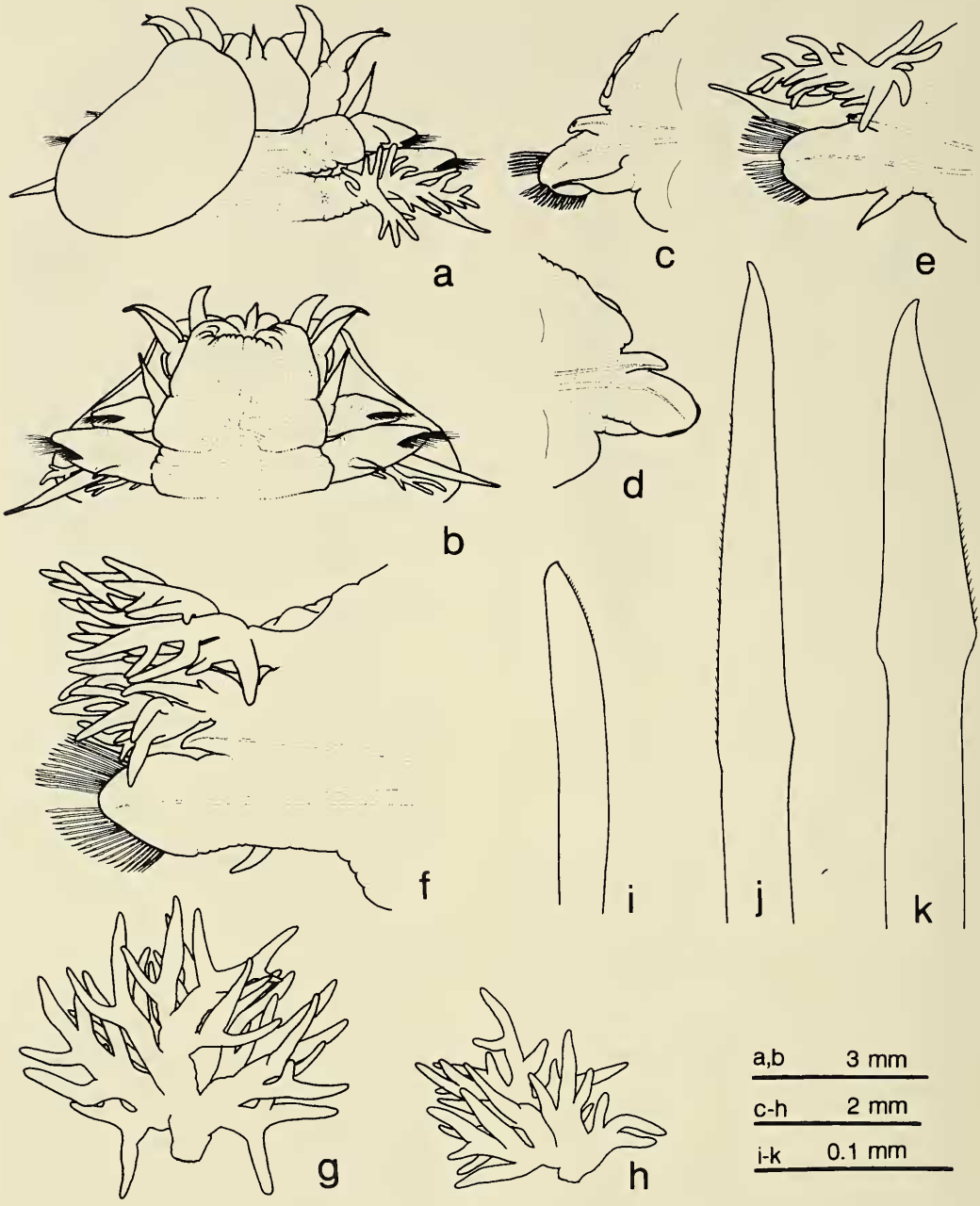

Fig. 2. *Branchipolynoe pettiboneae,* Holotype: a, Anterior end, dorsal view; b, Same, ventral view; c, Right elytragerous parapodium from segment 2, elytron removed, anterior view; d, Same, posterior view; e, Right cirrigerous parapodium from segment 3, anterior view; f, Right elytragerous parapodium from segment, 9, elytron removed, anterior view; g, Upper group of branchiae from segment 9, lateral view; h, Lower group of same, lateral view; i, Notoseta from segment 15; j, Supraacicular neuroseta from same; k, Upper subacicular neuroseta from same.

neuropodium large with slightly bilobed presetal acicular lobe and rounded postsetal lobe (Fig. 2c, d). Segment 3 with dorsal cirri, arborescent branchiae, and parapodia similar to segment 2 (Fig. 2a, b, e). Following parapodia subbiramous, with short, small, digitiform notopodia and long rounded neuropodia (Fig. 2f). Notosetae few, up to 5 per parapodium, scarcely projecting, stout, slightly tapered, with serrated distal margin (Fig. 2i). Neurosetae stouter than notosetae, tapered, wider subdistally, with serrated distal margin and slightly hooked tips (Fig. 2j, k). Distal serrated parts of supraacicular neurosetae (Fig. 2j) longer than subacicular neurosetae (Fig. 2k). Upper subacicular neurosetae (Fig. 2k) stouter than supraacicular and lower subacicular neurosetae.

Variation in paratypes (Fig. 3a–g).—From the Izena Hole of the Okinawa Trough, about 1300 km West of the type locality, the Kaikata Seamount, four polynoids associated with deep-sea mussels were collected. The host bivalve from the Izena Hole is presumably an undescribed species of the genus *Bathymodiolus,* while that of the holotype from the Kaikata Seamount is a species of the genus *Adula.* A careful study of these polynoids, however, leads us to consider that the polynoids from both hydrothermal areas belong to the same species. In three paratypes, the muscular pharynx was extended (Fig. 3a, b). There are 5 pairs of dorsal and ventral papillae around the opening and 2 pairs of smooth jaws inside. The smallest paratype measures 16 mm long by 5.7 mm wide including parapodia with 21 segments (Fig. 3a, b). All morphological characters agree with those of the holotype, except for the anterior region. In this small paratype, the first pair of elytra did not cover the anterior dorsum completely (Fig. 3a), perhaps caused by the extended pharynx and its consequent inflation of the anterior segments. In the smallest paratype, the upper subacicular neuroseta (Fig. 3f) is much stouter than the lower neurosetae (Fig. 3g). Supraacicular and lower subacicular neurosetae are subequal in width (Fig. 3e, g). The neurosetae (Fig. 3e–g) are stouter than the notosetae (Fig. 3d). These differences in the width of the setae are more obvious in the smallest paratype than in the holotype and other paratypes.

Etymology.—The species is named in honor of Dr. Marian H. Pettibone of the National Museum of Natural History, Smithsonian Institution, in our deep respect for her excellent papers on the family Polynoidae.

Remarks.—In the genus *Branchipolynoe,* two previously known species are clearly distinguishable from each other by morphological characters. *B. symmytilida* Pettibone, 1984, from the Galapagos Rift, has small elytra and branchiae starting on segment 2, while *B. seepensis* Pettibone, 1986, from the Gulf of Mexico, has large elytra and branchiae beginning on segment 3. *B. pettiboneae* is very close to *B. seepensis* in these characters. They differ in the structure of the notopodia. The new species has the subbiramous parapodia, with reduced digitiform notopodia and up to 5 notosetae, while *B. seepensis* has the biramous parapodia, with large conical notopodia and moderate number of notosetae (up to 20 in adults).

Subfamily Branchinotogluminae Pettibone, 1985

Genus *Opisthotrochopodus* Pettibone, 1985

Opisthotrochopodus japonicus, new species

Figs. 4–6

Material.—Kaikata Seamount, off Chichijima Island, *Shinkai 2000* Dive 404, 29 Apr 1989, 26°42.3'N, 141°05.0'E, 625 m, collector J. Hashimoto, sieving from bottom sediments, holotype (NSMT Pol.-H 328); paratype (USNM 131184).

Description.—Holotype 3.7 mm long, 3.1 mm wide including parapodia, with 21 seg-

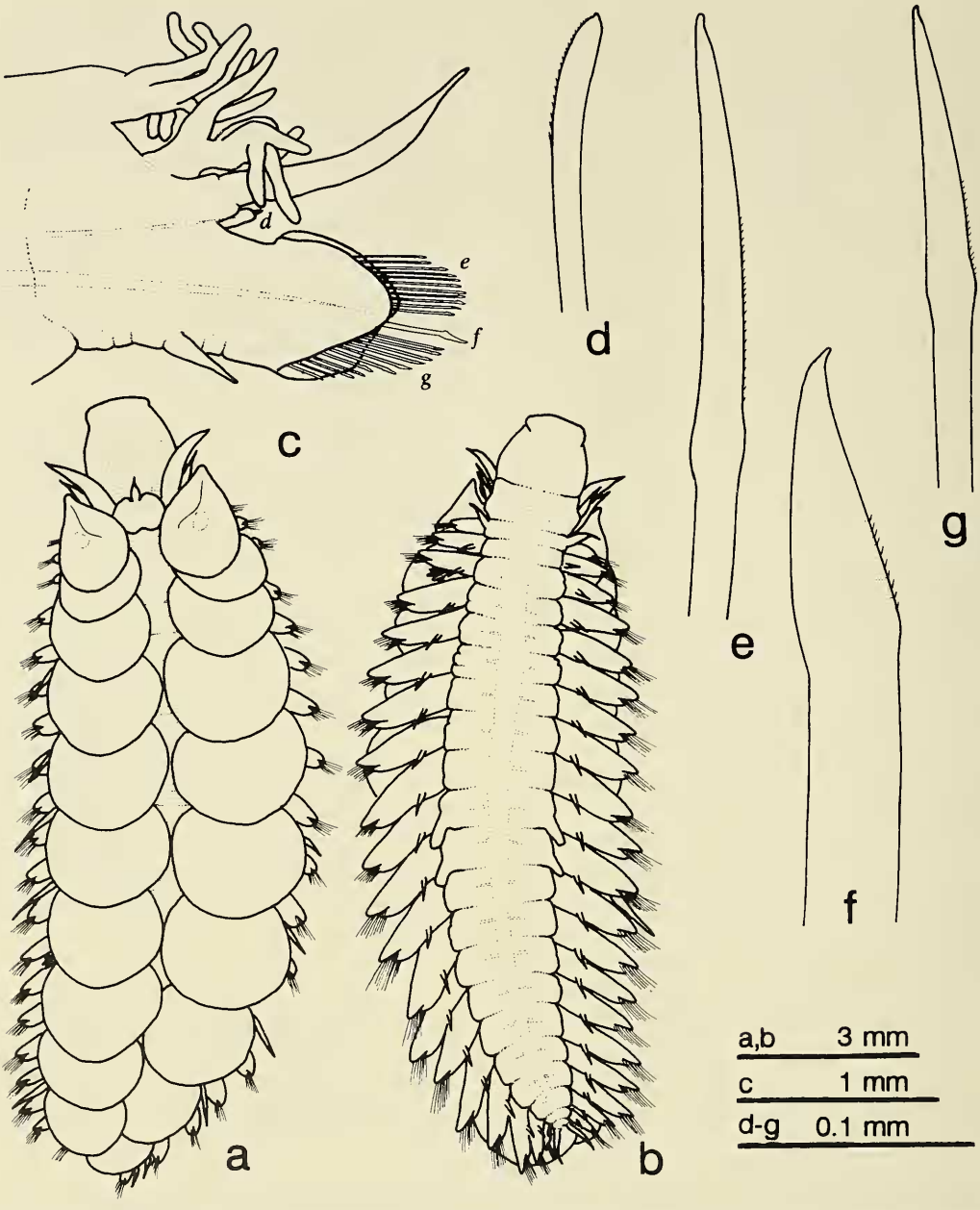

Fig. 3. *Branchipolynoe pettiboneae,* paratype (USNM 131183): a, Dorsal view, pharynx extended; b, Ventral view; c, Right cirrigerous parapodium from segment 10, posterior view; d, Notoseta from same; e, Supraacicular neuroseta from same; f, Upper subacicular neuroseta from same; g, Lower subacicular neuroseta from same.

ments. Body short, flattened, tapering slightly anteriorly and posteriorly, with parapodia longer than trunk width (Fig. 4a, b). Pharynx not extended, with two pairs of dark jaws. Pair of long segmental ventral papillae present on segment 12; 5 pairs of squarish ventral lamellae present on following segments 13 to 17 (Fig. 4b). Pygidium with 2 short anal cirri (Fig. 4a, b, e, f).

Elytra 10 pairs, covering dorsum com-

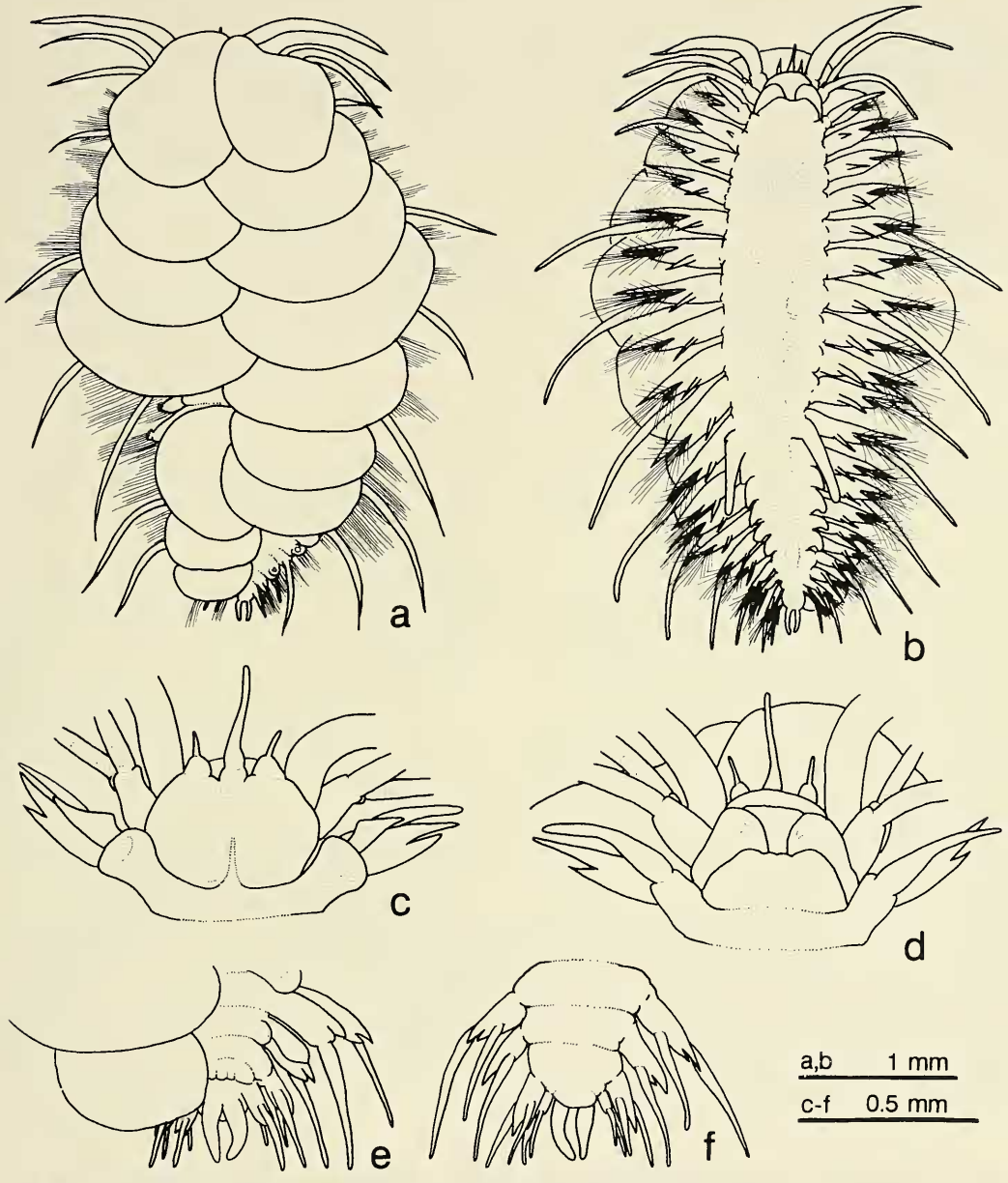

Fig. 4. *Opisthotrochopodus japonicus,* Holotype: a, Dorsal view; b, Ventral view; c, Anterior end, dorsal view, setae not shown; d, Same, ventral view; e, Posterior end, dorsal view, setae not shown; f, Same, ventral view.

pletely, present on segments 2, 4, 5, 7, 9, 11, 13, 15, 17, 19. Elytra very large, overlapping, oval, delicate, without tubercles or papillae (Fig. 4a, e). Dorsal cirri on non-elytragerous segments 3, 6, 8, 10, 12, 14, 16, 18, 20, 21, with cylindrical cirrophores on dorso-posterior side of notopodia and very long smooth styles; dorsal tubercles nodular (Fig. 5b, d). Branchiae arborescent, in two groups on segments 3–14, not conspicuous on segment 15, and in form of single globular papilla on segment 16.

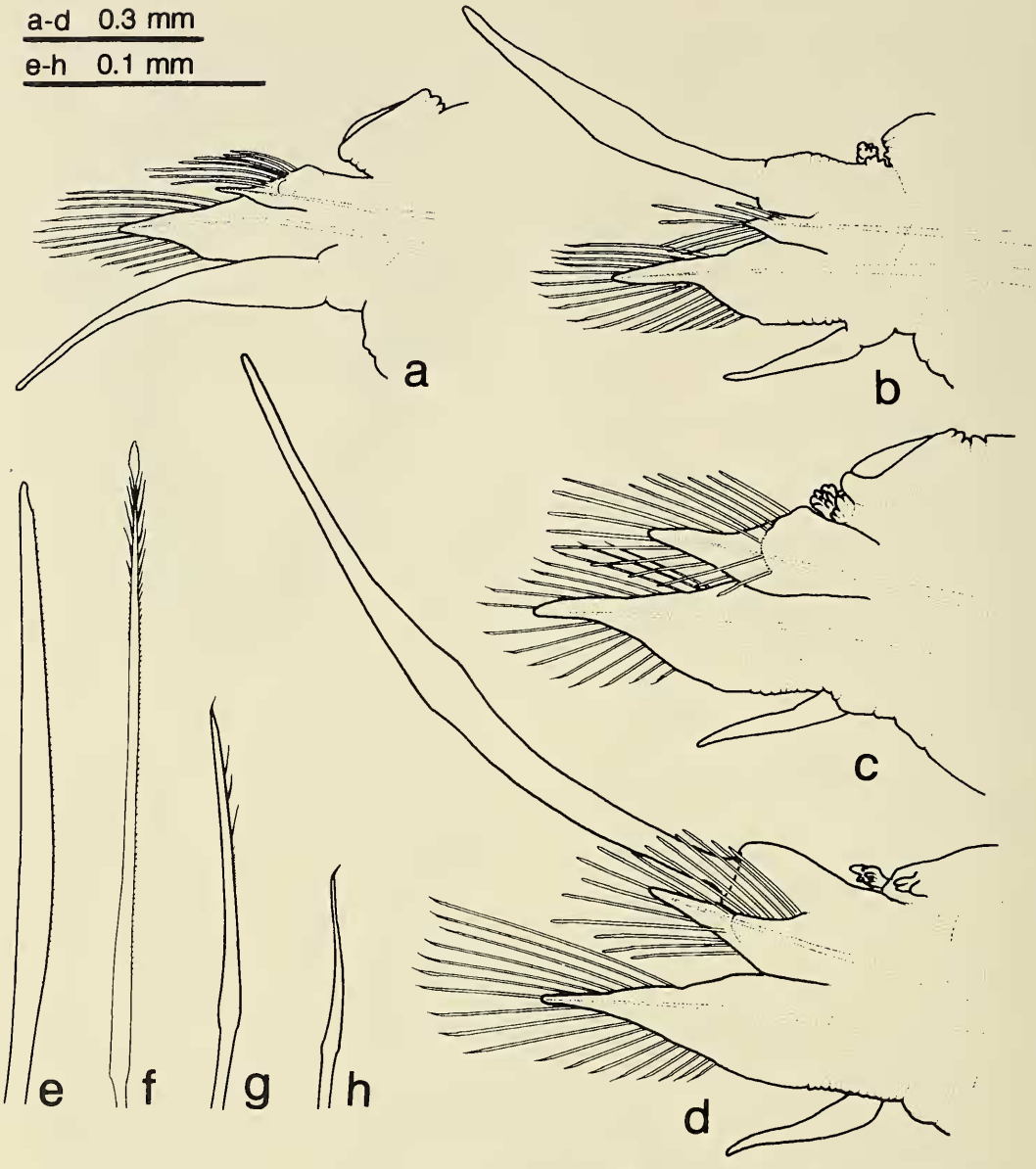

Fig. 5. *Opisthotrochopodus japonicus,* Holotype: a, Right elytragerous parapodium from segment 2, anterior view; b, Right cirrigerous parapodium from segment 3, anterior view; c, Right elytragerous parapodium from segment 9, anterior view; d, Right cirrigerous parapodium from segment 10, anterior view; e, Notoseta from same; f, Supraacicular neuroseta from same; g, Upper subacicular neuroseta from same; h, Lower subacicular neuroseta from same.

Bilobed prostomium with short cylindrical anterior lobes terminating in cirriform tips and non-ocular paired oval areas well-stained by Methyl Green, but without eyes; median antenna with bulbous ceratophore in anterior notch and short slender style; palps long, tapered, smooth, about 5 times as long as prostomium (Fig. 4a–d).

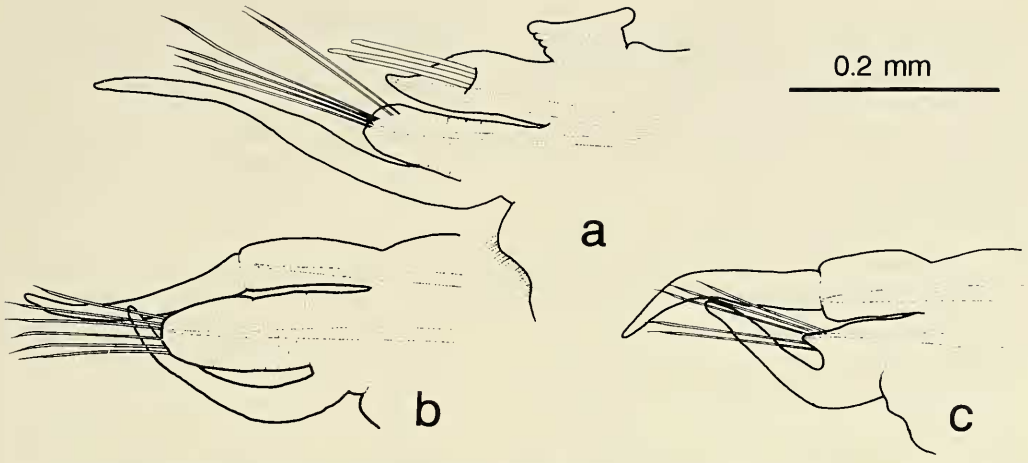

Fig. 6. *Opisthotrochopodus japonicus,* Holotype: a, Right elytragerous parapodium from segment 19, anterior view; b, Right cirrigerous parapodium from segment 20, anterior view; c, Same from segment 21, anterior view.

Tentacular segment not distinct dorsally; tentaculophores lateral to prostomium, achaetous, with 2 pairs of long tentacular cirri as long as palps; dorsal tentacular cirri slightly longer than ventral (Fig. 4b–d). Segment 2 with first pair of elytrophores, biramous parapodia, and long slender ventral buccal cirri; notopodium with distinct acicular lobe and stout notosetae, without notopodial bract; neuropodium with long acicular lobe and slender neurosetae (Fig. 5a).

Parapodia biramous, except for those on segments 20 and 21 (Fig. 5a–d). Notopodia conical, with prominent acicular processes, without distinct notopodial bracts except on segment 19. Neuropodia larger and longer than notopodia, with conical presetal acicular lobes and short rounded postsetal lobes. Ventral cirri short, tapered.

Notosetae numerous, stouter than neurosetae, tapered to blunt tips, with faint spinous margin (Fig. 5e). Neurosetae very numerous, slender. Supraacicular neurosetae with 2 rows of subdistal prominent spines and inflated tips (Fig. 5f). Upper subacicular neurosetae faintly spinous, with short capillary tips and a few long subdistal spines on spinous margin (Fig. 5g). Lower subacicular neurosetae smooth, with short capillary tips (Fig. 5h).

Posterior 3 segments compressed with parapodia much smaller and directed posteriorly (Fig. 4b, e, f). Parapodia of elytragerous segment 19 biramous, with rami similar in length; notopodium with thickened dorsal bract and few stout notosetae; neuropodium with faint spinous long neurosetae; ventral cirrus tapered, cirriform, longer than neurosetae (Fig. 6a). Parapodium of segment 20 subbiramous, with notopodial acicular lobe fused to cirrophore of dorsal cirrus, without notosetae; neuropodium cylindrical, similar to that of segment 19; ventral cirrus tapered, cirriform, shorter than neurosetae (Fig. 6b). Parapodium of segment 21 subbiramous, with notopodium fused to dorsal cirrus; neuropodium small, with short conical acicular lobe; ventral cirrus tapered, similar to that of segment 20 (Fig. 6c).

Etymology.—The specific name, *japonicus,* is based on the collecting site, the Kaikata Seamount in Japan.

Remarks.—The genus *Opisthotrochopodus* differs from other branchiate polynoids in having a pair of long segmental papillae on segment 12, 5 or 6 pairs of short lamellae on the following segments, and the compressed posterior segments. The genus consists of 4 species from various hydrothermal

vents: *O. alvinus* Pettibone, 1985, from the Galapagos Rift, East Central Pacific, *O. tunnicliffeae* Pettibone, 1988, from the Northeast Pacific Explorer and Juan de Fuca Ridges, *O. marianus* Pettibone, 1989, from the Mariana Back-Arc Basin, West Central Pacific, and *O. japonicus,* from the Kaikata Seamount, Northwest Pacific. *O. alvinus* is easily distinguishable from other congeners in having the greatly modified parapodia with wheel organ on segment 20. *O. tunnicliffeae* has the ventral cirri on posterior parapodia as in the new species, however it is separated from the latter in the presence of the balloon organ and the harpoon neurosetae on segment 20. In the genus *O. japonicus* is most close to *O. marianus* in the setal composition and the structure of parapodia, however it differs from the latter in the absence of the neuropodial oval lamellae on segment 21 instead of the presence.

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